

U.S.S.N. 10,810,918

Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to clarify Applicants invention. No new matter has been added.

For example support for the amendments is found in the previously presented claims as well as the Figure 2 and Specification at:

In the Abstract:

"A water purification system including a high-efficiency reverse osmosis (HERO) system and a base dosing system for rapidly raising the pH of wastewater treated in the system. The invention includes an ion exchange unit for initially removing positive and negative ions from the wastewater. A high-efficiency reverse osmosis (HERO) system is provided downstream of the ion exchange unit for further removing ions from the wastewater. A base dosing system is provided between the ion exchange unit and the HERO system for dosing a base into and rapidly raising the pH of the wastewater as the wastewater flows from the ion exchange unit into the HERO system."

paragraph [0024]

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"In accordance with these and other objects and advantages, the present invention generally relates to a new and improved water purification system including a high-efficiency reverse osmosis (HERO) system and a base dosing system for rapidly raising the pH of wastewater treated in the system. The invention includes an ion exchange unit for initially removing positive and negative ions from the wastewater. A high-efficiency reverse osmosis (HERO) system is provided downstream of the ion exchange unit for further removing ions from the wastewater. A base dosing system is provided between the ion exchange unit and the HERO system for dosing a base into and rapidly raising the pH of the wastewater as the wastewater flows from the ion exchange unit into the HERO system."

paragraph [0030]

"The present invention contemplates a water purification system having a base dosing system for rapidly raising the pH of acidic wastewater, typically from semiconductor fabrication processes, as the wastewater flows from an ion exchange unit to a high-efficiency reverse osmosis (HERO) system. The present invention further includes a base dosing method for raising the pH of acidic wastewater during treatment of the wastewater. The base dosing system includes a base dispensing tank that contains a sodium hydroxide solution of high concentration, dosing pumps, valves and piping. The sodium hydroxide is dispensed into the wastewater as the wastewater flows from an ion exchange unit, raising the pH of the wastewater from about 3~4 to about 6~7 prior to entry of the wastewater into a HERO system. The HERO system further raises the pH of the wastewater to about 8.5~10. The resulting purified, de-ionized water is suitable for use in semiconductor fabrication processes, for example. However, it is understood that the system and method of the present invention is equally applicable to purifying wastewater in other industries."

Claim Rejections under 35 USC 112, Second paragraph

Claim 9 has been amended to overcome Examiners rejection.

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Claim Rejections under 35 USC 102

1. Claims 1, 3, 5, 7, 9, 11, and 15-20 stand rejected under 35 USC 102(b) as being anticipated by Mukhopadhyay (US 5,925,874).

Mukhopadhyay discloses a water purification system with a pH decrease stage and then a pH increase stage where feed water is first passed through a weak acid cation exchange resin (12; Figure 9) (see Abstract; col 5, lines 52-59; col 7, lines 31-37; col 9, lines 63-col 10, line 4); acid (14; fig 9) is then added to the effluent destroy any alkalinity (i.e., make neutral pH (7)) (col 10, lines 5-8); the zero alkalinity effluent is then treated to remove carbon dioxide (19; Fig 9) (i.e., created from the weak acid cation resin); **The decarbonated effluent (zero alkalinity) is then treated with base (22; Fig 9) to raise the pH to preferably 10 or higher (col 10, lines 9-19) prior to passing the effluent to a reverse osmosis unit (30, 30(N); Fig 9).** Alternatively, to raise the zero alkalinity effluent following decarbonation, the zero alkalinity effluent (and decarbonated) may be passed through an anion exchange unit (31; Figure 9; (col 12, lines 23-29) (see also col 22, lines 6-26).

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Thus Mukhopadhyay fails to disclose several elements of Applicants invention including those elements in **bold type**, including Applicants two step pH increase configuration:

With respect to claim 1:

"A water purification system for purifying wastewater with a **two step pH increase configuration**, comprising:

an ion exchange unit for removing **both positive and negative ions** from the wastewater;

a base dosing system provided in fluid communication with said ion exchange unit for raising a pH of the wastewater in a first step of said two stage pH increase configuration; and

a high-efficiency reverse osmosis system provided in fluid communication with said base dosing system for further removing ions from the wastewater and raising the pH of the wastewater in a second step of said two step pH increase

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configuration.

With respect to claim 9:

"water purification system for purifying wastewater with a two step pH increase configuration, comprising:

an ion exchange unit for removing **both positive and negative ions** from the wastewater;

a base dosing system provided in fluid communication with said ion exchange unit for raising a pH of the wastewater in a first step of said two step pH increase configuration; and

a high-efficiency reverse osmosis system comprising at least one first stage and at least one second stage filter membranes provided in fluid communication with **said base dosing system** for further removing ions from the wastewater and further increasing said pH in a second step of said two step pH increase configuration;

wherein **said base dosing system** is in fluid communication

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with a fluid communication line connecting said ion exchange unit to said high-efficiency reverse osmosis system."

With respect to claim 15:

"A method of purifying wastewater with a two step pH increase process, comprising the steps of:

providing an ion exchange unit for removing both negative and positive ions from a feed comprising said wastewater;

providing a high-efficiency reverse osmosis system in fluid communication with said ion exchange unit;

distributing the wastewater through said ion exchange unit to produce a first effluent wastewater;

raising the pH of the first effluent wastewater in a first step of said two step pH increase process; and

raising the pH of the first effluent wastewater by

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producing a second effluent wastewater from the first effluent wastewater in a second step of said two step pH increase process by distributing the first effluent wastewater through a high-efficiency reverse osmosis system."

Thus, Mukhopadhyay is clearly insufficient to anticipate Applicants invention.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

"The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claim Rejections under 35 USC 103

2. Claims 2, 4, 6, 8, 10, and 12 stand rejected under 35 USC 103(a) as being unpatentable over Mukhopadhyay, above, and further in view of Jangbarwaia (5, 951, 874).

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Applicants reiterate the comments made above with respect to Mukhopadhyay.

Even assuming *arguendo* a proper motivation for combining Jangbarwaia with Mukhopadhyay, the fact that Jangbarwaia teaches storing a base in a tank in a method and system for regenerating (backflow followed by forward flow) cation and anion exchange beds where a tank for holding base anionic bed regenerate fluid (col 9, lines 38-41; col 10, lines 24-27; col 11, lines 57-59; items 13 and 10; Figure 1), such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

3. Claim 13 stands rejected under 35 USC 103(a) as being unpatentable over Mukhopadhyay, above, and further in view of Walter (3,143,581).

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Applicants reiterate the comments made above with respect to Mukhopadhyay.

Even assuming *arguendo* a proper motivation for combining Walter with Mukhopadhyay, the fact that Walter teaches a plurality of deflector plates disposed underneath a spray nozzle to deflect the projected stream across the entire horizontal area of a treating chamber containing a packed bed of contact material (see col 1, lines 9-15; col 50, lines 51-56; col 2, lines 1-7; col 2, lines 32-33), such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

4. Claim 14 stands rejected under 35 USC 103(a) as being unpatentable over Mukhopadhyay in view of Walter above, and further in view of Jangbarwaia.

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Applicants reiterate the comments made above with respect to Mukhopadhyay, Walter and Jangbarwaia.

Even assuming *arguendo* a proper motivation for combining Jangbarwaia with Mukhopadhyay and Walter, such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Conclusion

The cited references, individually or in combination, fail to produce Applicants invention and are therefore insufficient to make out a *prima facie* case of anticipation or obviousness with respect to Applicants disclosed and claimed invention.

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The claims have been amended to further clarify Applicants' disclosed and claimed invention. A favorable consideration of Applicants' claims is respectfully requested.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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